Graph-Drawing Contest Report

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Abstract. This report describes the the 1994 Graph Drawing Competition, held in conjunction with the 1994 Graph Drawing Workshop.

1 Introduction

The format of the 1994 Graph Drawing Competition was simple: adjacency lists of four graphs G_1, G_2, G_3, and G_4 were made publicly available in July/August 1994. Participants were invited to create drawings (in PostScript) of any or all of the four graphs with a deadline in early October, just before the 1994 Graph Drawing Workshop in Princeton, New Jersey.

Properties of the graphs included the following:

1. G_1: a tree with 44 vertices, diameter 11, and maximum degree 7.
2. G_2: an undirected planar graph with 44 vertices, 87 edges, and maximum degree 14. This graph contains some relatively regular substructures, including two 3×3 grids, several tetrahedra. Apart from a few pendant vertices, it is biconnected.
3. G_3: a nonplanar undirected graph with 38 vertices and maximum degree 6. It contains a 3×4 grid; otherwise, it has very little structure.
4. G_4: an acyclic nonplanar directed graph with 40 vertices, 131 arcs, maximum indegree 10, and maximum outdegree 9.

A panel of five experienced graph-drawing researchers met on October 9 1994 and chose a winner for each graph. The criteria used by the judges was simply beauty; there was no explicit attempt to quantify beauty in terms of the classical aesthetic criteria such as numbers of edge crossings, symmetries, etc.

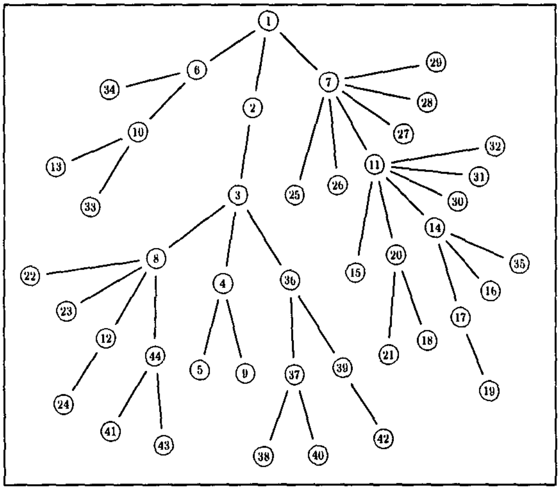
2 Winning submissions

The winning submissions for graphs G_1, G_2, G_3, and G_4 are in Figures 1, 2, 3, and 4, respectively.

1. G_1: The winner, from Uwe Wuerker of the Technical University of Chemnitz-Zwickau, used a novel tree-drawing convention. Although no root was specified, the drawing uses vertex number one as a root. Wuerker's drawing convention includes the novel aspect of drawing the children of each vertex v on an arc of a circle centered at v.
2. G_2: The winner, from Stefan Hougardy of Humbolt-Universität zu Berlin, has many isomorphic subgraphs drawn similarly.
3. G_3: The winner was an orthogonal drawing by Petra Mutzel and Thomas Odenthal of Universität zu Köln. Mutzel reported that this drawing has the minimum number of edge crossings. Note also that the angles of edges leaving nodes is strictly controlled, and bend minimization has been employed.
4. G_4: The winner was a muscle-like drawing by Georg Sander from the University of Saabrucken. In fact, Sander's drawing did not have the minimum number of edge crossings; but the well-spaced spline curves are mostly unimodal and the visual effect is very good.

TREE

GD' 94 Graph Drawing Competition



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Graph	generated by OptiMax / manually edited / layouted with LaTeX

Fig. 1. The best drawing of the tree.

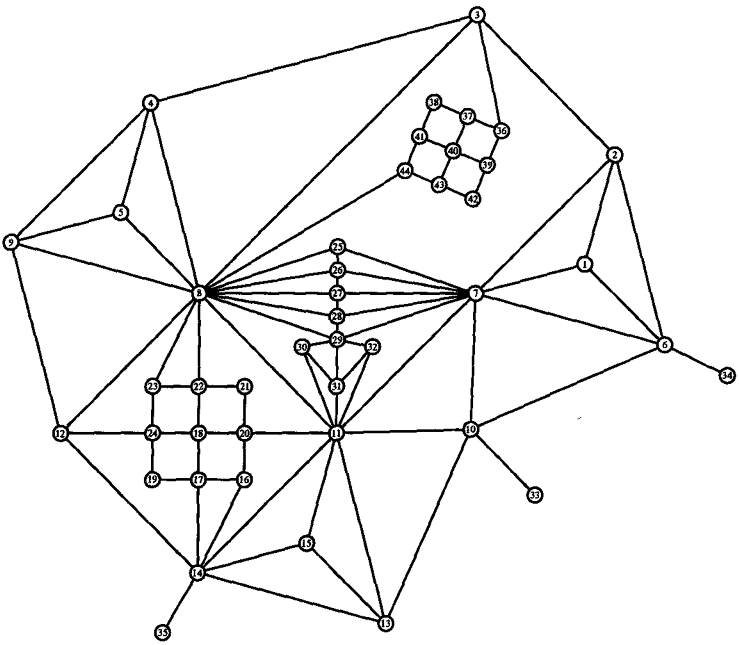

Fig. 2. The best drawing of the planar graph. This drawing was created semi-automatically with GraphCAD 2.90.

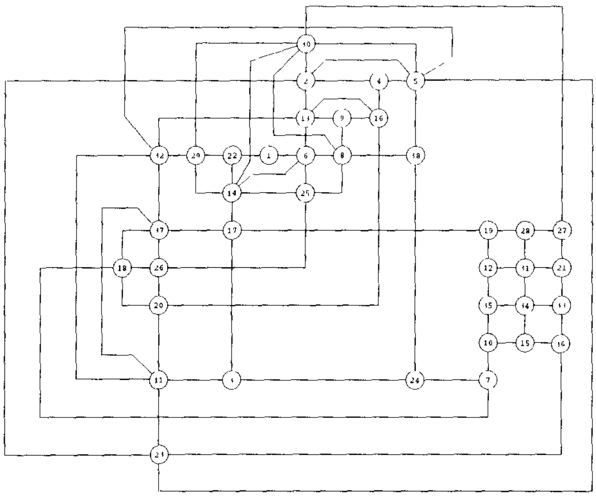

Fig. 3. The best drawing of the undirected graph. This drawing was obtained by determining the degree-4-constrained maximum planar subgraph, drawing it with the minimizing-bends algorithm of Tamassia (implemented in GraphEd), and adding the removed edges interactively with GraphEd.

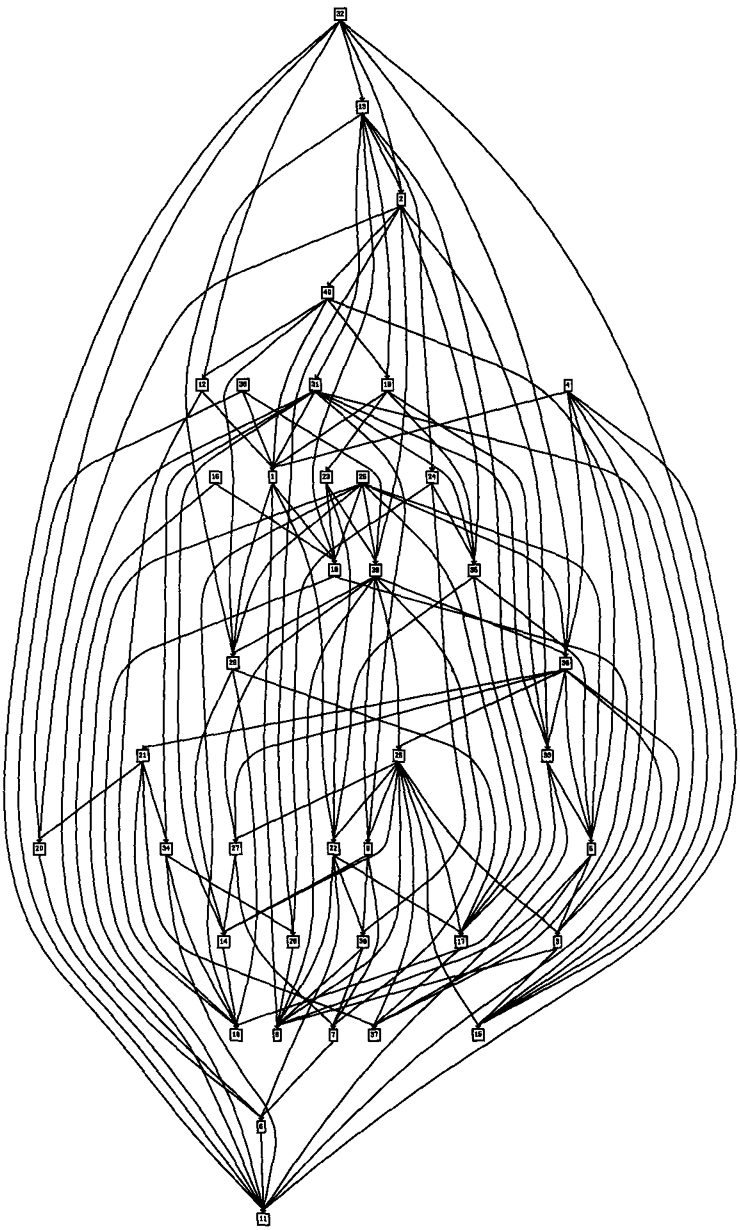

Fig. 4. The best drawing of the directed graph. Since the VCG (version 1.1) tool is specialized for directed graphs, the specification is laid out without any manual preparation. The graph is acyclic, thus topological sorting is used for the rank assignment of the nodes. We use median weights for crossing reduction and splines to display the edges. It results in a layout with 532 crossings.